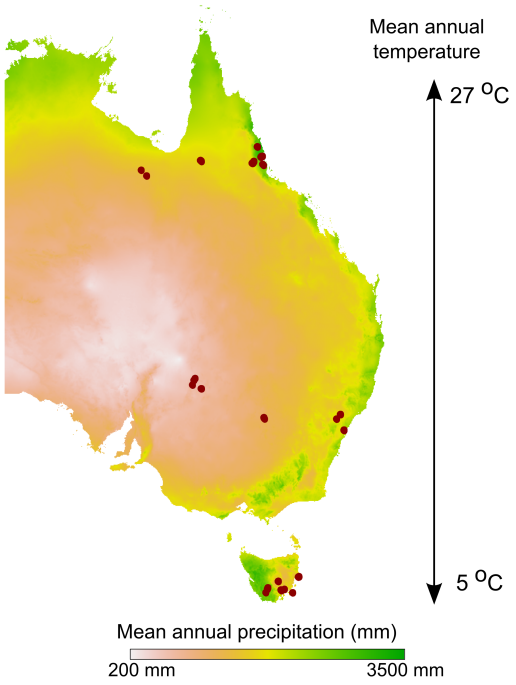
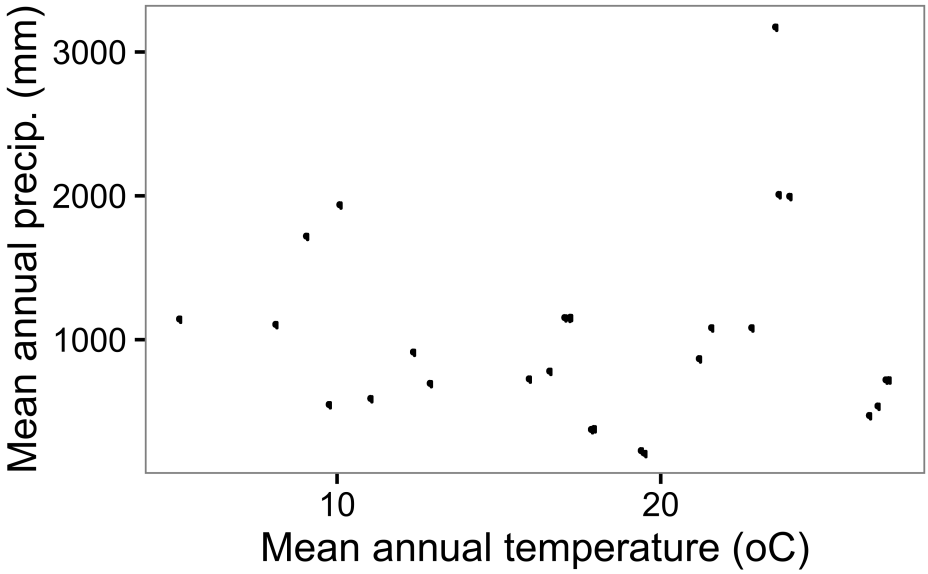
LEAF PROTEOMICS STUDY

Sampling locations

Approximately 1300 samples taken across gradients of temperature and precipitation.

Map & climatic coverage of study sites





Taxa:

100 species in total; 25 *Acacia* (320 samples), 33 *Eucalyptus* inc. *Corymbia* & *Angophora* (430 samples) and 42 Proteaceae (550 samples)

Data collected

- Quantitative proteomics @ 4 leaf ages - new, mid, old, senescent (~80% of spp.); 3 biological replicates
- Photosynthesis data for ~50% of leaves
- Leaf chlorophyll, LMA, leaf CNP, light evironment (fisheye lens photographs), soil CNP
- Modelled climate (eMast) and soil (Soil & Landscape Grid of Australia) data

Proteomics

Quantitative analyis allows comparison of protein amounts between functional groupings, and between individuals.

Used a hierarchical functional annotation scheme to assign proteins to functional groupings e.g. Photosystems, Calvin cycle, biotic_stress, heat shock proteins, protein folding, DNA and RNA synthesis machinery, hormone metabolism enzymes.

Combined protein amounts per group are used as the unit of analysis.

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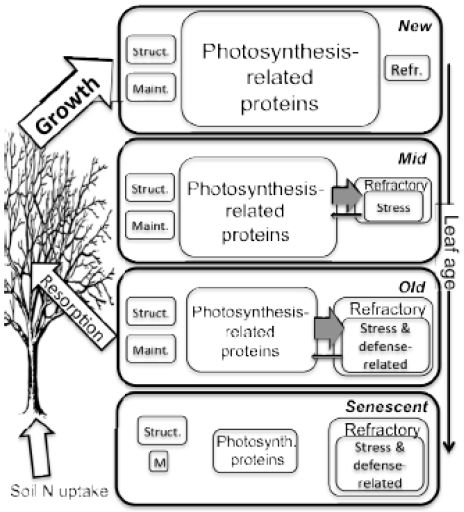
DISCOVERY PROJECT

Background



Hypothesized relationshups among pools of protein nitrogen. Light arrows indicate acquisition of N and allocation to new growth. The four large boxes represent leaves ageing from top to bottom. Dark arrows within leaves indicate reallocation of N during stress (large arrows) and recovery (small arrows). The majority of proteins in young leaves are photosynthesis-related, mostly Rubisco. As leaves age and experience stress, N is allocated to stress- and defense-related proteins. Because some stress- and defense-related proteins are resistant to proteolysis, N is not fully returned to photosynthesis-related proteins during stress recovery. Thus, N accumulates those refractory proteins as leaves age. A high proportion of N in senesced leaves is likely stress- and defense-related proteins. Similarly, other refractory proteins, regardless of functional group (e.g. structural proteins), might accumulate with age also.

Discovery Project research questions

Q1: As leaves age (but while still alive and photosynthetically active), does the amount of leaf N in refractory stress- and defenserelated proteins increase, at the expense of photosynthetic proteins, and potentially account for the decline in photosynthetic capacity with age?

Q2: Do differences among species in fraction of leaf N resorbed reflect differences in the proportion of N that is in refractory proteins towards the end of leaf life?

Q3: Do the Npool changes associated with leaf aging (as hypothesized under Q1) come about faster in short-lived leaves?

Q4: Do differences among species in N resorption efficiency and proficiency reflect different fractions of N placed in constitutive defenses from the outset of the leaf's life?

Q5: Are ratios of stress- and defense-related proteins to photosynthesis-related proteins higher at lower latitudes?

Q6: Do the ratios of stress- and defense-related proteins, and photosynthesis-related proteins differ with aridity?

Other research questions of immediate interest wrt *Euc.* samples

X1: Is Rubisco the most abundant protein in leaves?

X2: What does the stoichiometry of photosynthesis machinery look like, and how does it change with environmental conditions?